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ABSTRACT

This summary of the larger report analyzes the implications of new communication technologies for business, politics, culture, and individuals, and suggests possible strategies and options for Congressional consideration. The first of four major sections describes the changing U.S. communications infrastructure. The second section summarizes some of the opportunities and constraints presented by new communication technologies, including discussions of communication and comparative advantage in the business arena, communication and the democratic process, communication and the production of culture, and communication and the individual. Policy issues and Congressional strategies are discussed in the third section. Issues addressed include equitable access to communication opportunities; security, survivability, and interoperability of the infrastructure; modernization and technological development of the U.S. communication infrastructure; and jurisdiction in the formulation and implementation of national communication policy. The fourth section presents the case for a national market, economic, and social vision of the role of communication. Figures included throughout illustrate Congressional options in response to changes in the communication infrastructure. (GL)

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CRITICAL CONNECTIONS

Communication for the Future

Summary

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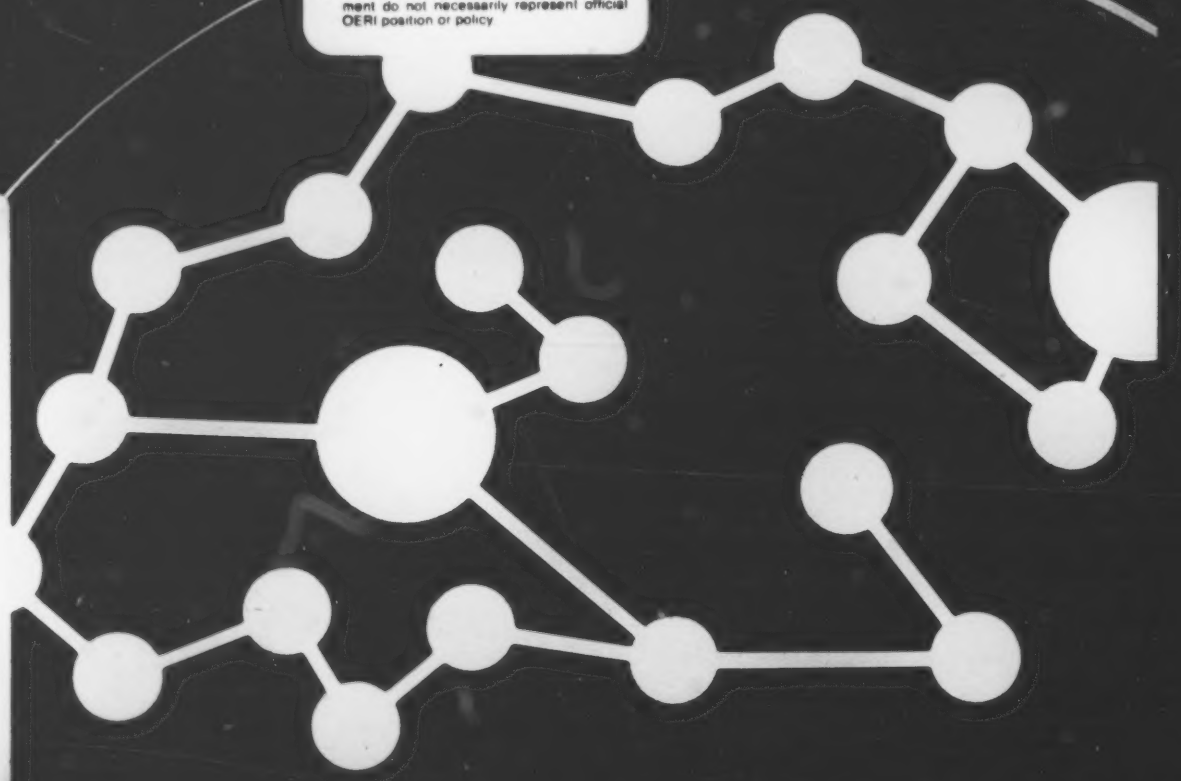

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CRITICAL CONNECTIONS

Communication for the Future

Summary

CONGRESS OF THE UNITED STATES OFFICE OF TECHNOLOGY ASSESSMENT

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Foreword

The U.S. communication infrastructure is changing rapidly as a result of technological advances, deregulation, and an economic climate that is increasingly competitive. This change is affecting the way in which information is created, processed, transmitted, and provided to individuals and institutions. In addition, the lines that historically have divided domestic and international communication systems and markets are gradually disappearing. Today, decisions concerning communication systems and industries must reflect a global perspective.

While new technologies have the potential to effectively meet the needs of an information-based society, they will undoubtedly generate a number of significant social problems. In some areas they will create opportunities; in others, they may constrain activities. How these technologies evolve and are applied—as well as who will reap their benefits and bear their costs—will depend on decisions now being made in both the public and private sectors.

To provide a broad context for evaluating the impacts of new communication technologies, the House Committee on Energy and Commerce asked the Office of Technology Assessment to undertake this study. The report analyzes the implications of new communication technologies for business, politics, culture, and individuals, and suggests possible strategies and options for congressional consideration.

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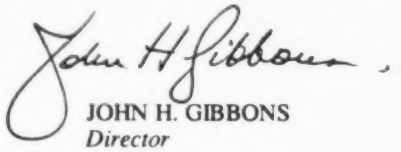

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INTRODUCTION

The U.S. communication system is changing dramatically. Recent advances in information storage, processing, and transmission technologies, occurring in a newly deregulated and increasingly competitive economic climate, are rapidly reconfiguring the Nation's communication infrastructure. New computer and communication technologies have already transformed the regulation and market structure of the industry, altering the way information is created, processed, transmitted, and provided to individuals and institutions.

Changes are also taking place at the international level. Because the new technologies encourage the flow of, and the demand for, information products and services across national borders, they are wearing away the lines that historically have divided domestic and international communication systems and markets. Communication is one of the fastest growing sectors in the international marketplace, and international conglomerates are increasingly being formed to provide products and services both at home and abroad.

New technologies hold promise for a greatly enhanced system that can meet the changing needs of an information-based society. At the same time, however, these technologies will undoubtedly generate a number of significant social problems. How these technologies evolve, as well as who will be affected positively or negatively, will depend on decisions now being made in both the public and private sectors. This study provides a context for evaluating these decisions.

CHANGING COMMUNICATION INFRASTRUCTURE

The communication infrastructure is the underlying structure of technical facilities and institutional arrangements that supports communication via telecommunication, broadcasting, film, audio and video recording, cable, print, and mail. Although the "public works" connotation of infrastructure may lead some to think of the term as public facilities, most of the U.S. communication infrastructure is held by private individuals and firms.

With digitalization all of the media become translatable into each other—computer bits migrate merrily—and they escape from their traditional means of transmission . . . If that's not revolution enough, with digitalization the content becomes totally plastic—any message, sound, or image may be edited from anything into anything else.

Stuart Brand
The Media Lab: Inventing the Future at MIT, 1988.

The communication infrastructure helps shape communication through the nature of its technical facilities and the ways in which those facilities are organized and made available to users. Communication, in turn, is central to the business, political, and cultural life of a society, and to the individuals that comprise it.

The societal effects of the Nation's communication infrastructure are determined by its overall technical capabilities, their availability, and their patterns of use. Three aspects of the infrastructure are relevant:

1. the technical characteristics of the communication facilities themselves;
2. the economic interdependencies among producers, distributors, and users of communication facilities; and
3. the policy goals and rules that define and constrain these relationships.

The following advances in communication technologies are generating changes in all three aspects:

- improved technical performance in transmission, encoding, decoding, storage and retrieval, and content production, at decreasing costs;
- convergence of communication functions, as well as communication products and services;
- decentralization of intelligence and control throughout communication systems with the development of software-driven and software-defined communication facilities;
- the availability of some discrete communication services that were previously provided only as part of a package (unbundling);
- increased portability of products and services;
- improved ease of use through better software design;
- increased networking capability; and
- increased capability to target messages to specific individuals or groups.

These technological trends and their socioeconomic impacts are unraveling the existing U.S. communication system, creating new opportunities, players, and problems. In the wake of these changes, fundamental questions are being raised about how to organize communication systems to promote innovation, maximize the benefits of competition, and capture economies of scale and scope. Moreover, the fact that the various media are converging as a result of digitization raises basic questions about the rules that govern access to communication technologies. Above all, questions are being raised about the goals of the communication system, as well as how, and by whom, future communication policy decisions should be made.

If Congress is to affect the future of the U.S. communication infrastructure, it will need to address these questions, perhaps by revisiting and reevaluating the Nation's basic goals for communication. To successfully renovate the Nation's communication policy, Congress will need to gain the support of, and coordinate its efforts with, an ever-increasing number of players in a variety of decisionmaking arenas. The task is a critical one, notwithstanding the difficulties involved in such an undertaking. **If Congress fails to act decisively and generate broad support, the opportunity to make deliberate choices about new communication technologies—and about the nature of American society itself—will be overtaken by rapid technological advances, the hardening of stakeholder positions and alliances, and the force of international developments and events.**

OPPORTUNITIES AND CONSTRAINTS PRESENTED BY NEW COMMUNICATION TECHNOLOGIES

To determine the role that government might play in the realm of communication, Congress will need to consider the opportunities that new communication technologies offer society, as well as the obstacles that prevent those opportunities from being realized. The stakes are high—for businesses, the democratic process, culture, and individuals—because using communication effectively provides a strategic advantage in achieving goals. Taking advantage of new communication technologies in one of these four realms may, however, conflict with their use in the other three. For example, providing communication systems that meet the security standards of business and government may limit the extent to which the same systems can be used for research and collaborative efforts. Also, the business use of communication storage and processing technologies to target customers may create problems of information overload and of securing privacy for individuals.

Communication and Comparative Advantage in the Business Arena

Although the United States has fared reasonably well over the past few years, many observers are beginning to express serious reservations about the future of the U.S. economy and its ability to compete in an increasingly global environment. They point out that recent economic growth in the United States has been fueled by foreign capital, and that the growth of manufacturing exports has been slower than imports. Experts note that the continued decline of the U.S. economic position in world trade is having serious consequences for labor. Pointing to the recent success of the Japanese model of business organization, some have even suggested that, to be competitive, the United States may also need to develop and adopt new ways of organizing for production.

Many of those who are concerned about the U.S. economy look to the communication and information sectors to provide the impetus for future growth. This focus on "telematics" is not surprising, given the trend toward a greater role

Photo credit: Bell Atlantic

Mobile telephones allow personnel to communicate with their offices and clients while on the road. New cordless phones that can be carried on a belt are also being introduced to facilitate communication for those who work outside or away from their desks.

for information in advanced industrial societies, and the fact that the United States has traditionally had a comparative advantage in this area. Communication is regarded not only as a source of economic growth, but also as a means of reconfiguring work relationships to make them more effective.

Given the increased dependence of American businesses on information and its exchange, the competitive status among businesses and in the global economy will increasingly depend on the technical capabilities, quality, and cost of the communication facilities on which they can rely. **The emergence of new technologies provides a unique opportunity for businesses and nations to create comparative advantages in a changing world economy. Failure to exploit these opportunities is almost certain to leave many businesses and nations behind.**

How well American businesses are able to take advantage of these opportunities will depend on:

- the compatibility and interconnectivity of communication and information systems,
- the laws concerning the use of information,
- economic and technical resources,
- corporate culture and organizational structure,
- developments in international trade and international telecommunication regulation,
- domestic regulatory policies, and
- the availability of a skilled work force.

It is clear that if government wants to promote the effective use of new communication technologies to improve the economy, it must find ways to deal with issues such as standards and the standards-setting process, education and training, corporate organization and labor relations, and international trade.

The widespread deployment of new communication technologies for economic advantage may also raise equity issues. To use telecommunication competitively, many businesses are finding it necessary to create their own private communication networks. But the costs of such systems are high, in terms of both organizational and financial resources. Thus, many small companies cannot afford to take advantage of the new technologies. **To the extent that the government looks to new communication technologies to foster U.S. economic growth and development—and wishes its small and medium-sized companies to participate in this—it may need to take special steps to facilitate those companies' use of these technologies.**

Communication and the Democratic Process

Since communication is central to all political activities, the way in which the U.S. communication infrastructure evolves is likely to affect the future of the American political system. New technologies can create new communication pathways, allowing new gatekeepers to mediate political dialog. For this reason, political "outsiders" have historically viewed communication technologies as an effective means for becoming political "insiders." Those already in positions of authority have sometimes sought to structure laws and behavior in order to limit access to new communication technologies.

> **A new form of "politics" is emerging, and in ways we haven't yet noticed. The living room has become a voting booth. Participation via television in Freedom Marches, in war, revolution, pollution, and other events is changing *everything*.**
>
> Marshall McLuhan,
> Quentin Fiore, Jerome Agel
> *The Medium is the Massage*, 1967.

Today, many people regard the technological advances in communication as a means for enhancing both citizen participation and government performance. The interactive, online capabilities of new technologies, it is claimed, could allow citizens to directly voice their opinions on

Photo credit: C-SPAN

C-SPAN provides regular coverage of congressional floor debates and committee hearings via its cable network. Citizens can interact directly with program participants in Washington by telephone.

public issues, as well as conduct an ongoing dialog with other citizens, elected representatives, and government bureaucrats. Moreover, the targeting capabilities of the technology could improve the ability of citizens to identify like-minded people, create new interest groups, raise financial and political support, and track the activities of—as well as lobby—government officials.

Government agencies can improve their efficiency by using technologies that facilitate both networking and data storage and reprocessing. For example, the ability to identify specific groups can be used to improve law enforcement, immigration control, and the detection of fraud, waste, and abuse in welfare systems. Real-time communication among government agencies, through the use of online systems, could also make government operations more efficient and effective.

Other people are more skeptical of the effect of new technologies on government and politics. They view them as a means by which those already in positions of power or authority can further solidify their influence. For instance, they claim that online, interactive political dialogs will generate information about individuals that could be used by government to monitor the activities of groups or individuals. Moreover, they are concerned lest the targeting of specialized groups lead to greater fragmentation of the body politic. Some also fear that new communication capabilities will not be used to improve the substance of political debate, but rather to promote personality instead of policy.

In government and politics, as in the past, the impact of new communication technologies will be determined to a large extent by the rules, norms, and skills that govern access to them. The emergence of new political gatekeepers, and who they are, will be of critical importance. As information is treated more and more as a commodity to be bought and sold in the marketplace, the traditional political gatekeepers—including political parties, the traditional press, and government agencies—are being

replaced by new kinds of political gatekeepers, such as political consultants, media consultants, private sector vendors, and international newscasters. Whereas the traditional gatekeepers are governed by political rules and norms, the new gatekeepers are guided to a greater extent by market criteria. **Where markets dominate the allocation of communication resources—such as information, a speaking platform, or access to an audience—political access may become increasingly dependent on the ability to pay. Thus, the economic divisions among individuals and groups may be superimposed on the political arena.**

On another level, new international players, such as multinational news agencies, are replacing government officials as gatekeepers in areas such as international diplomacy. Depending on the extent of this development, the ability of the Nation to exercise its sovereignty through traditional diplomatic channels may be compromised.

Communication and the Production of Culture

Communication is the process by which culture is developed and maintained. Information, the content of communication, is the basic source of all human intercourse. Throughout history, information has been embodied and communicated in an ever-expanding variety of media, including spoken words, graphics, artifacts, music, dance, written text, film, recordings, and computer hardware and software. Together, these media and their distribution channels constitute the web of society that guides the direction and pace of social development. From this perspective, the communication of information permeates the cultural environment and is essential to all aspects of social life.

The new information and communication technologies provide many opportunities to enhance our culture by expanding the infrastructure for information-sharing and exchange. Communication can be used to generate greater amounts of information and new cultural forms, to make this knowledge more accessible, and to provide it in more convenient and suitable ways. Because these technologies are decentralized and widely available, they can provide the opportunity for more people to become actively involved in creative activities.

However, **it is likely that many of the cultural opportunities afforded by new communication technologies will not be realized without further government involvement or structural changes in the communication industry.** Recent communication history illustrates, for example, that technological developments leading to a greater number of transmission channels do not necessarily lead to increases in the diversity or quality of information content and programming. Equally important in determining the kind of content produced are the economic relationships among the key players in the communication arena. If, in the future, government wishes to encourage more people to become active in creating their own cultural environment, economic incentives may need to be considered. Moreover, efforts will need to be made not only to assure that people can access a broad variety of information and cultural content, but also that they have the skills and resources necessary to create, package, and distribute information.

A panoply of electronic devices puts at everyone's hand capacities far beyond anything that the printing press could offer. Machines that think, that bring great libraries into anybody's study, that allow discourse among persons a half-world apart, are expanders of human culture.

Ithiel de Sola Pool
Technologies of Freedom, 1986.

Communication and the Individual

Emerging technologies promise to provide individuals with opportunities to increase their personal autonomy, enhance their sense of connection to others, and, in general, enable

greater accomplishments and self-fulfillment. These same technologies, however, could produce the opposite outcomes, contributing to personal isolation, increased dependency, and the loss of privacy. How new technologies will affect individuals will depend in part on the rules that Congress adopts to govern access to information and the new communication technologies. For example, government decisions about access to the data that are collected in the course of economic transactions will affect individual privacy rights. Also, decisions about what kinds of information services telephone companies can provide will affect the speed at which, and the extent to which, fiber technologies and the information services they make available can be deployed to the home.

The medium, or process, of our time—electric technology—is reshaping and restructuring patterns of social interdependence and every aspect of our personal life.

Marshal McLuhan,
Quentin Fiore, and Jerome Agel
The Medium is the Massage, 1967.

The Nation's communication infrastructure is becoming increasingly complex. Individuals or firms are becoming more responsible for designing the various communication resources they require. In order to take the greatest advantage of new technologies, people will need to be more technically skilled and have access to better "navigational tools" (means to help people access the systems, analogous to today's TV guides or telephone books). Navigational tools will be crucial in making individuals aware of communication opportunities, and in providing guidance in the use of these systems. **The communication capabilities of individuals—their "literacy" in the languages, commands, and structures of future systems—will largely determine the benefits they receive.**

The extent to which access depends on the ability to pay will also determine the impact of

Photo credit: Bell Atlantic

New caller identification terminals use a small electronic screen to display the telephone number from which an incoming call was placed.

new communication technologies on individuals. In telephony, for example, there is general agreement that services should be provided universally and it has been clear what those services should be. Until recently, achieving consensus was relatively simple because the range of telephone services that could be offered was narrow. The needs of all users could thus be equated and the cost of service could be shared; therefore, the price that individuals were charged for service could be set relatively low. With shared usage it was possible to allow some users to subsidize others.

Today, the concept of providing universal service on a common, shared network, as well as the system of subsidies that supported it, is breaking down. Major questions are being raised about the kinds of communication services that are needed, and the degree to which all users have equivalent needs that

can be served in the same fashion. Thus, the question of what should constitute universal service in an information age needs to be readdressed. Depending on how this question is answered, the United States could be faced with a two-tiered communication system, which would give rise to issues of equitable access. For example, if businesses view their needs as unique and decide to develop their own private networks, as some are doing now, there may be insufficient revenues available to support an advanced public network to serve all individuals. Under such circumstances, the costs and prices of services would be higher, to the extent that there are diminished economies of scale and scope.

New technologies will not only affect how people access information, but also how information impinges on people's lives. The pace of technological change has created confusion about the appropriate standards for information use. For instance, what privacy protections should individuals expect? While eager to take advantage of new electronic shopping opportunities, many people are unaware that transaction data generated in the process can be collected, processed, and used in the future as tools for marketing or even surveillance. While embracing new ways to access information for their own use, many individuals may find it difficult to cope with the fact that others, in turn, now have much greater access to them.

POLICY ISSUES AND CONGRESSIONAL STRATEGIES

Although new communication technologies afford a myriad of socioeconomic opportunities, many of these opportunities may go unrealized. Some may fail to materialize for lack of foresight, public demand, or political will. Others may founder because of poor circumstances and timing. Some opportunities can only be fulfilled at the expense of others.

The need to make trade-offs among opportunities is particularly great in communication because communication lies at the heart of social activity. For example, the growing use of private branch exchanges (PBXs) and high-speed data transmission lines to create private business telephone networks may, if carried too far, drain the pool of financial and human resources available to the public switched telephone network. This could limit the extent to which the communication infrastructure can serve other economic, political, and social goals. **Making such trade-offs is likely to be more contentious in the future because the strategic value of information is increasing in business, politics, culture, and individual development and personal growth.**

Analyzing the potential for conflict among new communication opportunities, OTA identified five major areas in which public policy issues are likely to arise:

1. equitable access to communication opportunities,
2. security and survivability of the communication infrastructure,
3. interoperability of the communication infrastructure,
4. modernization and technological development of the communication infrastructure, and
5. jurisdiction in formulating and implementing national communication policy.

These are characterized below, along with congressional strategies and options for addressing them.

Equitable Access to Communication Opportunities

The opportunities for people to participate in economic, political, and cultural life depend on their ability to access and use communication and information services. Individuals need skills and tools to locate the communication pathways, information, and audiences in a timely fashion and in an appropriate form. Unequal access to communication resources leads to unequal advantages, and ultimately to inequalities in social and economic opportunities.

OTA found that **changes in the U.S. communication infrastructure are likely to broaden the gap between those who can access communication services and use information strategically and those who cannot.** Moreover, the people most likely to be adversely affected are those whom the new communication technologies could help the most—the poor, the educationally disadvantaged, the geographically and technologically isolated, and the struggling small and medium-sized business.

OTA identified a number of factors that are likely to contribute to access problems. For example, technological advances, deregulation, and increased competition have led to the reduction of a number of communication subsidies, and to changes in the way in which many communication services are operated and financed. For some, these developments are increasing the cost of purchasing communication services. The overall costs of identifying, locating, and applying relevant information in a timely fashion are on the rise. Costs are increasing because there is a larger volume of information for individuals and businesses to cope with, and because the tools and systems needed to deal with the larger volume are becoming more complex. Access to communication services is also likely to be more limited in the future if trends toward increased mergers and vertical integration of communication-related industries continue at their present pace, and if media gatekeepers, in selecting content, are increasingly guided by market criteria. It is more difficult to establish appropriate rules for access in this rapidly changing environment. **New technologies are challenging traditional regulatory criteria, magnifying the confusion and inconsistencies that surround first amendment rights, and dismantling the traditional definition of universal service.**

Ownership in every major medium now includes investors from other media—owners of newspapers, magazines, broadcasting, cable systems, books and movies mixed together. In the past, each medium used to act like a watchdog over the behavior of its competing media . . . But now the watchdogs have been cross-bred into an amiable hybrid, with seldom an embarrassing bark.

Ben H. Bagdikian,
The Media Monopoly, 1987.

In addressing these problems, Congress may have to move in some new, and untried, directions. Past policies to promote access to both communication and information focused on assuring access to transmission media. Barriers to access were reduced by structuring the rights of those who owned the transmission systems (for example, by limiting the number of broadcast stations that an individual can own), or by structuring the prices that users paid for transmission service (as in the case of telephone and postal rates). Using transmission media as the leverage for access was the chosen regulatory approach, given first amendment proscriptions limiting government's role in regulating content. It was, moreover, a relatively effective approach because transmission media represented the major bottleneck to communication access.

Today, this is no longer the case. Although transmission bottlenecks still exist (as, for example, in the local telephone exchange), new kinds of bottlenecks are also appearing. Some of these have more to do with the identification, production, and application of information content than with its transmission. These bottlenecks occur because people lack, for example, the necessary technical skills, navigational tools, and access to production facilities. To effectively promote communication access in the future, government policies will need to focus more on these newly emerging barriers to access.

Congress could pursue six different strategies to improve access to communication services:

1. influence the means by which communication services are funded and financed,
2. structure the prices at which communication services are offered,
3. provide direct government support for users to access information and communication paths,
4. regulate and/or redefine the rights of media owners,
5. influence the level and availability of the tools and resources required to access communication and information services, and
6. assume a more proactive role to assure robust debate on issues of public importance.

These strategies, and the options that each might entail, are summarized in figure 1. An analysis of the benefits and disadvantages of adopting any of these options is provided in chapter 9 of the full report.

Security/Survivability of the Communication Infrastructure

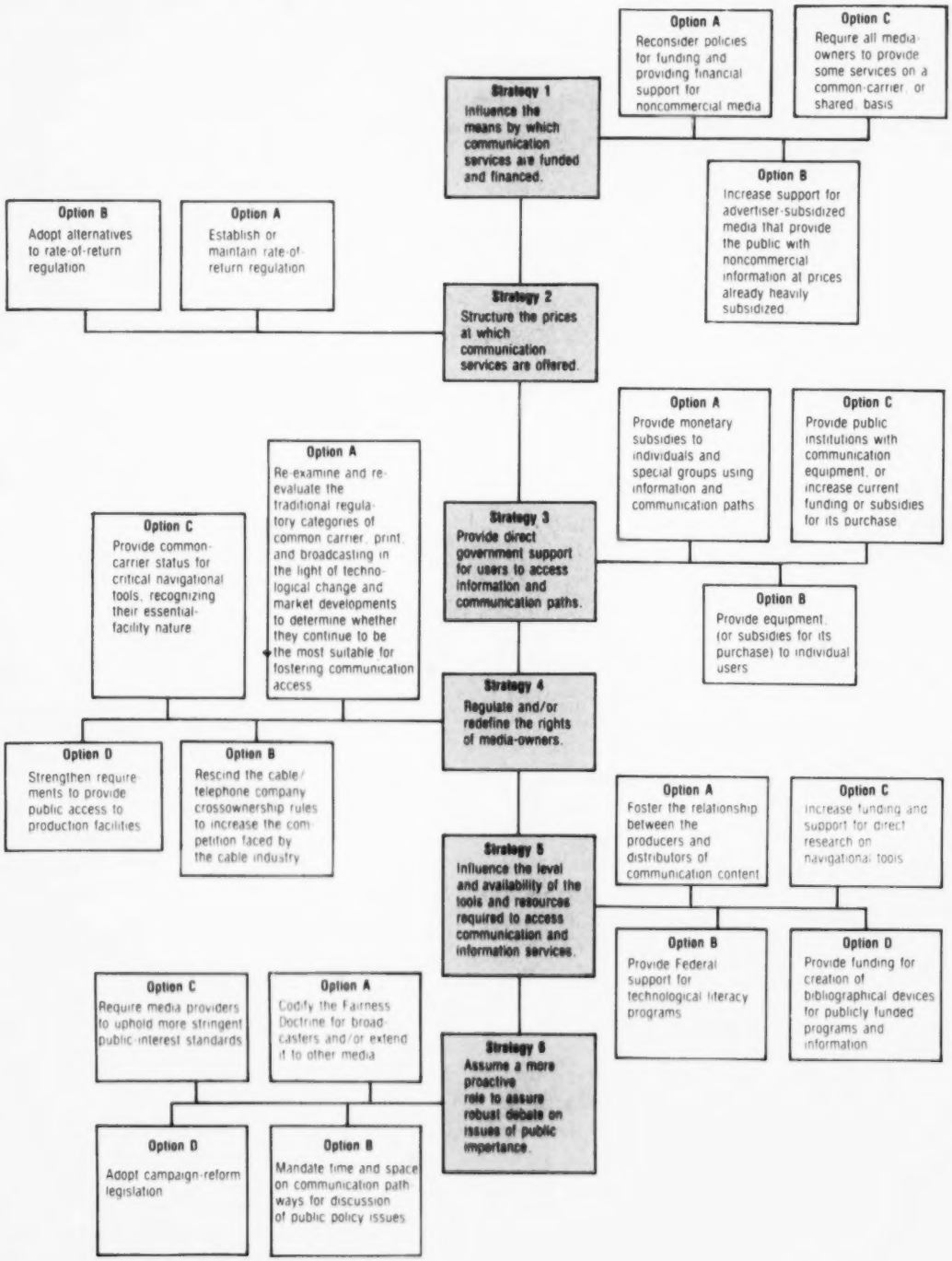
Adequate security and survivability are essential characteristics of an acceptable communication infrastructure. However, establishing a secure and survivable infrastructure requires trade-offs against access, cost, and ease of use. Although most people probably support the general goal of security and survivability, there is disagreement with respect to the level of security and survivability needed, and the extent to which other communication goals should be sacrificed to achieve these goals.

OTA identified a number of factors and developments that can affect the security and survivability of the communication infrastructure. The increased reliance of business and government on communication and information systems makes them more vulnerable to system failures. The number and variety of problems that may threaten the security or reliability of communication systems are greater than in the past. Communication systems are more complex, decentralized, and interdependent. Thus, it is more difficult to achieve security and survivability goals.

In the past, issues surrounding the security and survivability of the communication infrastructure were not important to most Americans. Such problems were generally addressed behind the scenes in private businesses and government. These issues are becoming less containable. OTA found that **security and survivability goals are becoming more important and more visible; but it is also becoming more difficult to make the trade-offs in communication policy required to achieve these goals.** Stakeholders' views differ about how these trade-offs should be made and what policies should be pursued. In addition, government agencies are not adequately organized to resolve security and survivability issues and achieve security goals.

Congress may need to play a more active role in resolving competing security goals and in promoting the security of both private and public communication systems. The Federal Government's role in this area was traditionally limited to assuring that the Nation's communication infrastructure was secure and reliable enough to meet the needs for defense and emergency preparedness. Today, however, the public's stake in the security and survivability of communication systems goes well beyond defense and disasters. Given the dependence of many corporations on communication and information systems, there are now larger social costs from major failures in private systems. For example, in November 1985, a computer problem in the Bank of New York's offices prevented the company from completing an exchange of government securities. This fault in the system not only cost the bank $1.5 to $2 million after taxes; it also forced the bank to borrow $24 billion from the Federal Reserve System. In this sense, communication security problems occurring in the private sector are much more difficult to contain. As the role and value of communication increase, the likelihood that security problems will spill over into the public sector also increases.

Figure 1—Congressional Strategies and Options To Address Access to Communication Opportunities


Strategy 1
Influence the means by which communication services are funded and financed.
Option A
Reconsider policies for funding and providing financial support for noncommercial media
Option C
Require all media-owners to provide some services on a common-carrier, or shared, basis
Option B
Increase support for advertiser-subsidized media that provide the public with noncommercial information at prices already heavily subsidized
Strategy 2
Structure the prices at which communication services are offered.
Option B
Adopt alternatives to rate-of-return regulation
Option A
Establish or maintain rate-of-return regulation
Strategy 3
Provide direct government support for users to access information and communication paths.
Option A
Provide monetary subsidies to individuals and special groups using information and communication paths
Option C
Provide public institutions with communication equipment, or increase current funding or subsidies for its purchase
Option B
Provide equipment (or subsidies for its purchase) to individual users
Strategy 4
Regulate and/or redefine the rights of media-owners.
Option A
Re-examine and re-evaluate the traditional regulatory categories of common carrier, print, and broadcasting in the light of technological change and market developments to determine whether they continue to be the most suitable for fostering communication access
Option C
Provide common-carrier status for critical navigational tools, recognizing their essential-facility nature
Option D
Strengthen requirements to provide public access to production facilities
Option B
Rescind the cable/telephone company crossownership rules to increase the competition faced by the cable industry
Strategy 5
Influence the level and availability of the tools and resources required to access communication and information services.
Option A
Foster the relationship between the producers and distributors of communication content
Option C
Increase funding and support for direct research on navigational tools
Option B
Provide Federal support for technological literacy programs
Option D
Provide funding for creation of bibliographical devices for publicly funded programs and information
Strategy 6
Assume a more proactive role to assure robust debate on issues of public importance.
Option C
Require media providers to uphold more stringent public-interest standards
Option A
Codify the Fairness Doctrine for broadcasters and/or extend it to other media
Option D
Adopt campaign-reform legislation
Option B
Mandate time and space on communication pathways for discussion of public policy issues

SOURCE: Office of Technology Assessment, 1990.

Congress could pursue six different strategies to address the security and survivability of the communication infrastructure:

1. undertake further study and analysis of changing security and survivability needs of the communication infrastructure;
2. facilitate the transfer of information about security and survivability, garnered in the public agencies, to the private sector;
3. establish security and survivability requirements for key industrial sectors;
4. provide special emergency facilities for private sector use;
5. improve coordination of survivability planning; and
6. increase activity geared to preventing security breaches.

These strategies, and the options that each might entail, are summarized in figure 2 and analyzed in chapter 10 of the full report.

Interoperability of the Communication Infrastructure

Communication systems are, by definition, designed to interconnect. Thus interconnection, or interoperability, is critical to the communication infrastructure. The more interoperable a communication system is, the more connections it can provide and the more accessible it will be to everyone on an equal basis. Interoperability provides for redundancy, thus improving system survivability. Interoperability is important not only in a technical sense, but in an administrative sense as well. To be most useful, the infrastructure needs to be transparent to users in terms of the services offered.

Interoperability also has a downside. It can make a communication system more vulnerable to breaches in security by broadening access. To the extent that interoperability requires standardization, it can retard technological innovation and slow development of the system.

In the past, there were few problems in achieving adequate interoperability within the communication infrastructure. In the area of telephony, AT&T provided end-to-end service and system interconnection. The government played an important role in mass media and information processing, assuring, when necessary, that there was adequate standardization.

Interoperability is likely to become more of a technical and administrative problem in the future. Not only will the need for interoperability be greater, but achieving it is also likely to be more difficult. Five developments have contributed to the difficulties of ensuring interoperability. First, the growing importance of information and communication as a strategic resource attaches greater importance to the interoperability of any communication infrastructure. Second, many of the traditional ways that interoperability has been achieved have been eliminated. Third, the globalization of the economy has led to a greater need for international standards and the extension of standards-setting efforts to the international arena. Fourth, the number and variety of players in the standards-setting process have increased, as have the costs and stakes of adopting standards. Fifth, the standards that need to be set are more complex (e.g., anticipatory, process standards such as open systems interconnection [OSI][1] and integrated services digital networks [ISDN]).[2]

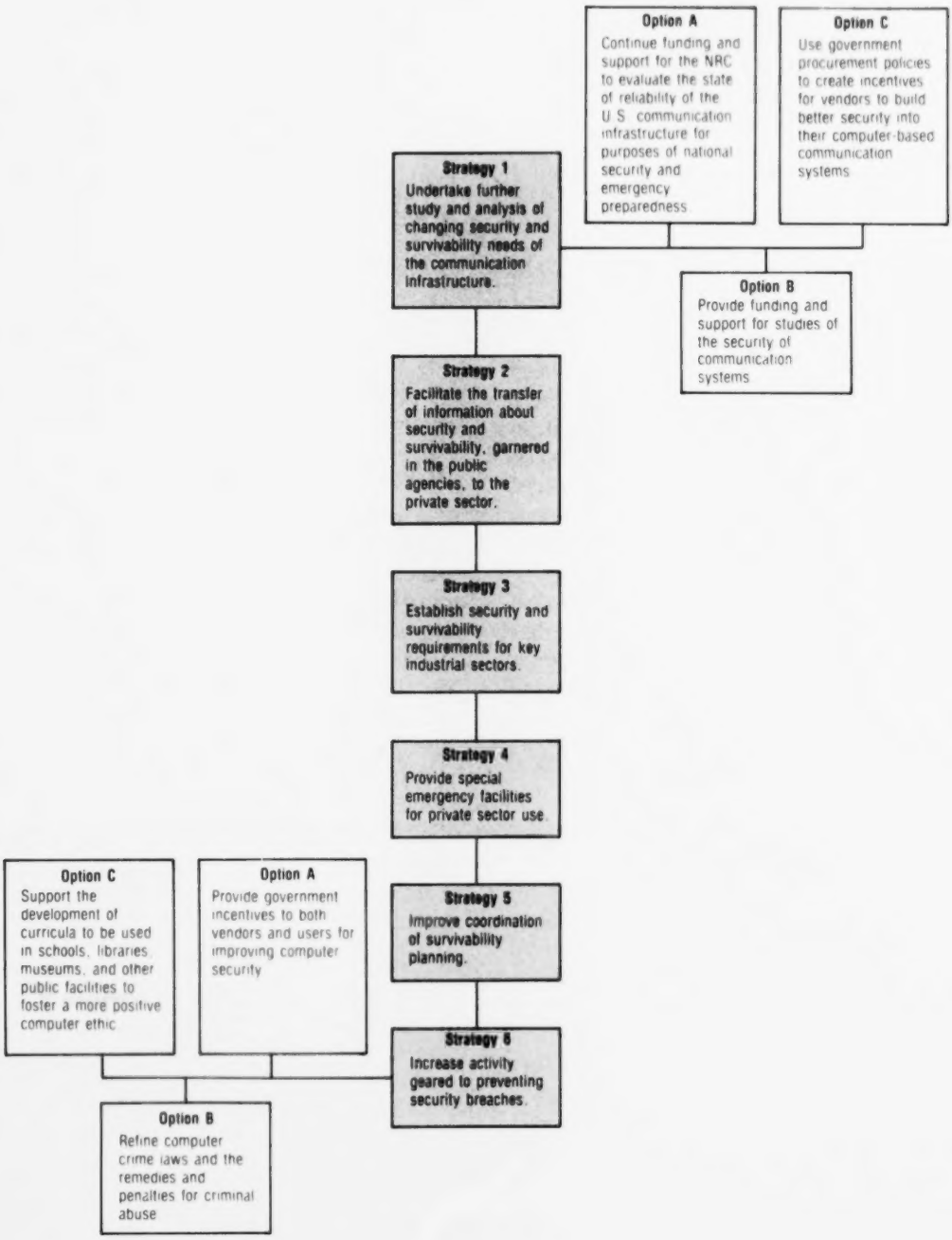
Although the overall circumstances in which particular government strategies are likely to be the most appropriate can be generalized, these will have to be tailored to each case. Congress could pursue five different strategies to address the interoperability of the communication infrastructure:

1. support research to provide better data and a more analytic rationale for standards-setting decisions;

[1]OSI is an architecture for computer networks and a family of standards that permits data communication and processing among diverse technologies.

[2]ISDN is a network that provides integrated switch and facility digital connections between user-network interfaces to provide or support a range of different communication services.

Figure 2—Congressional Strategies and Options To Address Security/Survivability of the Communication Infrastructure


Option A
Continue funding and support for the NRC to evaluate the state of reliability of the U.S. communication infrastructure for purposes of national security and emergency preparedness.
Option C
Use government procurement policies to create incentives for vendors to build better security into their computer-based communication systems.
Strategy 1
Undertake further study and analysis of changing security and survivability needs of the communication infrastructure.
Option B
Provide funding and support for studies of the security of communication systems.
Strategy 2
Facilitate the transfer of information about security and survivability, garnered in the public agencies, to the private sector.
Strategy 3
Establish security and survivability requirements for key industrial sectors.
Strategy 4
Provide special emergency facilities for private sector use.
Option C
Support the development of curricula to be used in schools, libraries, museums, and other public facilities to foster a more positive computer ethic.
Option A
Provide government incentives to both vendors and users for improving computer security.
Strategy 5
Improve coordination of survivability planning.
Strategy 6
Increase activity geared to preventing security breaches.
Option B
Refine computer crime laws and the remedies and penalties for criminal abuse.

SOURCE: Office of Technology Assessment, 1990.

2. allow for the emergence of market solutions, either in the form of gateway technologies or through the setting of de facto standards;
3. indirectly influence the standards-setting process by providing assistance and guidance to foster the setting of standards;
4. influence the setting of particular standards by providing incentives or imposing sanctions; and
5. mandate industrywide standards.

These strategies, and the options that each might entail, are summarized in figure 3 and analyzed in chapter 11 of the full report.

OTA identified three specific cases where interoperability—or the lack of it—will have major implications for U.S. communication policy. These are related to the establishment of ISDN, the evolution of OSI, and the creation of an open network architecture (ONA).[3] In considering whether Congress should take additional steps to encourage the standards-setting process in these three cases, certain factors need to be kept in mind. These are outlined, together with corresponding policy responses, in chapter 11 of the full report (tables 11-1, 11-2, and 11-3).

Modernization and Technological Development of the U.S. Communication Infrastructure

As the role of information increases in all aspects of life, additional demands will be made on the communication infrastructure. Some of these demands may increasingly be in conflict. The communication infrastructure will have to be more competitive in providing communication at the international level. To adequately meet and balance all of these communication needs, the U.S. communication infrastructure must make maximum use of advances in communication and information technologies. It will need to do so in the most efficient and cost-effective manner. The most critical policies are those related to research and development, capital investment, and human resource development.

Historically, the United States has set the international pace for technological development in communication and information technologies. However, in the late 1970s, technological advances began to outstrip the pace of change within the public shared telecommunication network, finally leading to the divestiture of AT&T and the emergence of a number of competing communication networks and service vendors. Although competition has clearly contributed to growth and economic activity in the communication sector, OTA identified a number of factors that suggest that in a competitive, global environment, the United States may find it increasingly difficult to retain its world technological leadership.

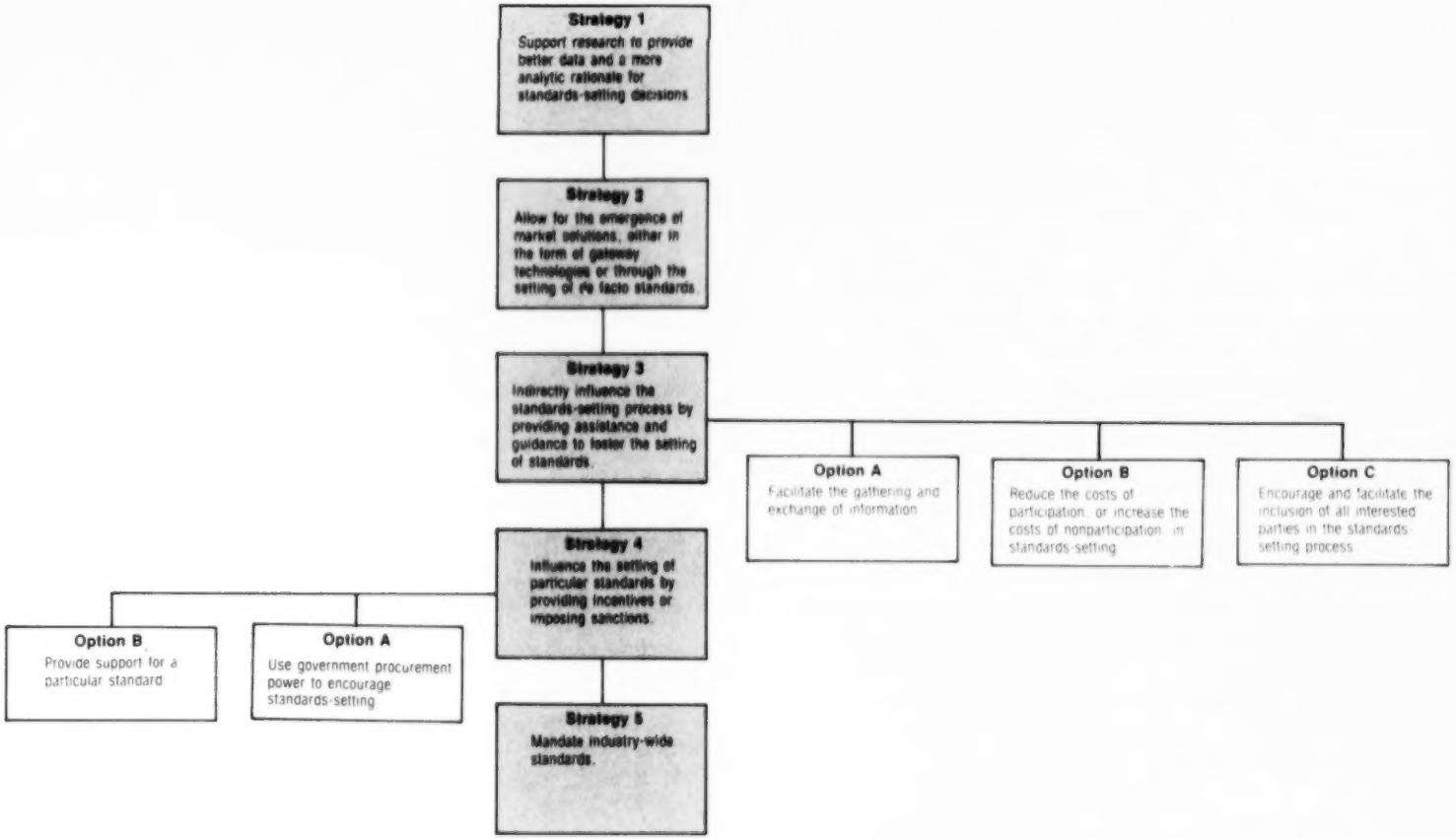
The first factor is the development of international competition resulting in an increase in the pace of technological advancement in communication infrastructure. The second is the high capital costs of modernizing the communication infrastructure and uncertainties as to how it will be financed. The potential inefficiencies that could result from lack of national coordination and planning for communication represent the third factor. The fourth is the proactive role played by foreign governments in modernizing their communication systems. The fifth factor is the fractionated U.S. decisionmaking process. The sixth is the limits of human resources for communication.

Congress could pursue three strategies to address the modernization of the communication infrastructure:

1. involve the government directly in the development, planning, financing, and coordination of the communication infrastructure;
2. provide indirect incentives for modernizing and developing the communication infrastructure; and

[3]ONA is the overall design of a carrier's basic network facilities and services to permit all users of the basic network to interconnect to specific basic network functions and interfaces on an unbundled and equal access basis.

Figure 3—Congressional Strategies and Options To Address Interoperability/Coordination of the Communication Infrastructure


Strategy 1
Support research to provide better data and a more analytic rationale for standards-setting decisions.
Strategy 2
Allow for the emergence of market solutions, either in the form of gateway technologies or through the setting of de facto standards.
Strategy 3
Indirectly influence the standards-setting process by providing assistance and guidance to foster the setting of standards.
Option A
Facilitate the gathering and exchange of information.
Option B
Reduce the costs of participation, or increase the costs of nonparticipation, in standards-setting.
Option C
Encourage and facilitate the inclusion of all interested parties in the standards-setting process.
Strategy 4
Influence the setting of particular standards by providing incentives or imposing sanctions.
Option B
Provide support for a particular standard.
Option A
Use government procurement power to encourage standards-setting.
Strategy 5
Mandate industry-wide standards.

SOURCE: Office of Technology Assessment, 1990.

3. create a regulatory environment that is more conducive to the modernization of the communication infrastructure.

These strategies, and the options that each might entail, are summarized in figure 4 and analyzed in chapter 12 of the full report.

Jurisdiction in the Formulation and Implementation of National Communication Policy

Rapid technological advances in communication, coupled with the unraveling of a traditional regulatory framework in the United States, have given rise to a highly uncertain communication policy environment. Occurring at a time when the role of information is particularly important, these developments will affect everyone. Each individual has a high stake in the outcome of current communication policy debates. An exceptionally equitable, efficient, and effective policymaking process will be required to find appropriate solutions to the complex and thorny policy dilemmas that society faces, and to reconcile the conflicts that will inevitably arise among competing—even if meritorious—interests. At the very least, the allocation of authority and the rules of the game will need to be clear and perceived by the public to be legitimate.

As the United States participates in the increasingly global information economy, the lack of a coherent and coordinated national communication policymaking process is likely to severely hinder the development and execution of a strategy for dealing with the myriad of communication issues that will emerge. The American policy process has always been somewhat disorderly because of the important role of federalism and the separation of powers in the U.S. political system. However, its untidiness has been particularly noticeable in communication policy—a fact that has already prompted two Presidential policy boards (in 1951 and 1968) to recommend the creation of a central agency to formulate overall communication policy.

OTA findings suggest that a number of factors are likely to make these problems worse in the future. These include the shift of communication decisionmaking from political institutions to the marketplace, the expanding links between communication policies and other socioeconomic policies, the increased interdependence of national and international communication policies, and the emergence of large users—often multinational corporations—as key players in communication decisions.

Congress could pursue four basic strategies to address jurisdictional issues in communication policymaking:

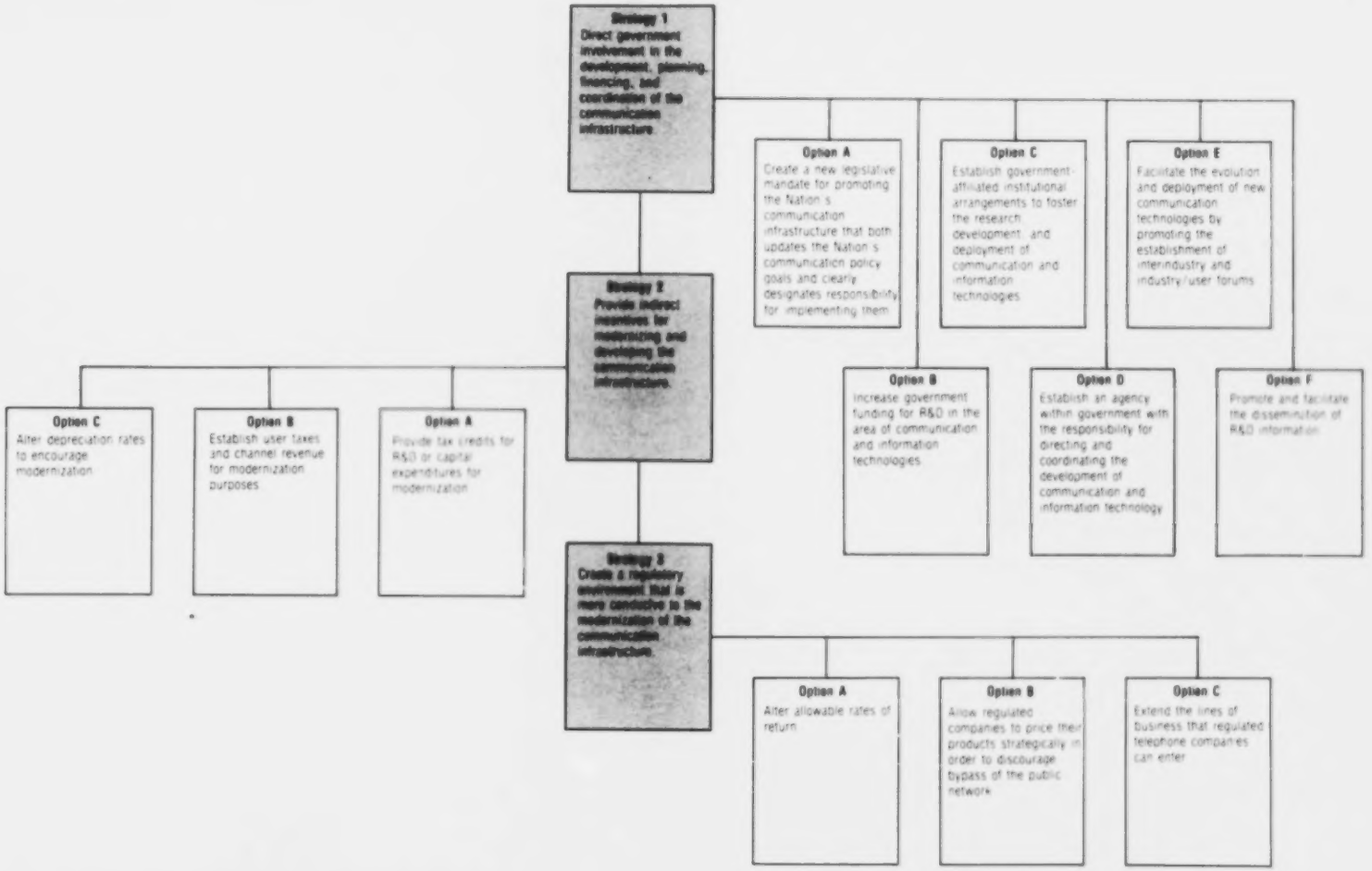
1. take the lead in establishing communication policy priorities and in allocating organizational responsibilities accordingly;
2. establish an ongoing organizational mechanism, outside of Congress, to resolve policy inconsistencies and jurisdictional disputes;
3. provide an interagency and/or interjurisdictional mechanism for coordinating communication policy and resolving jurisdictional issues; and
4. establish an institutional basis for facilitating coordination and cooperation among government agencies, industry providers, and communication users.

These strategies, and the options each might entail, are summarized in figure 5 and analyzed in chapter 13 of the full report.

THE NEED FOR A NATIONAL VISION OF THE ROLE OF COMMUNICATION

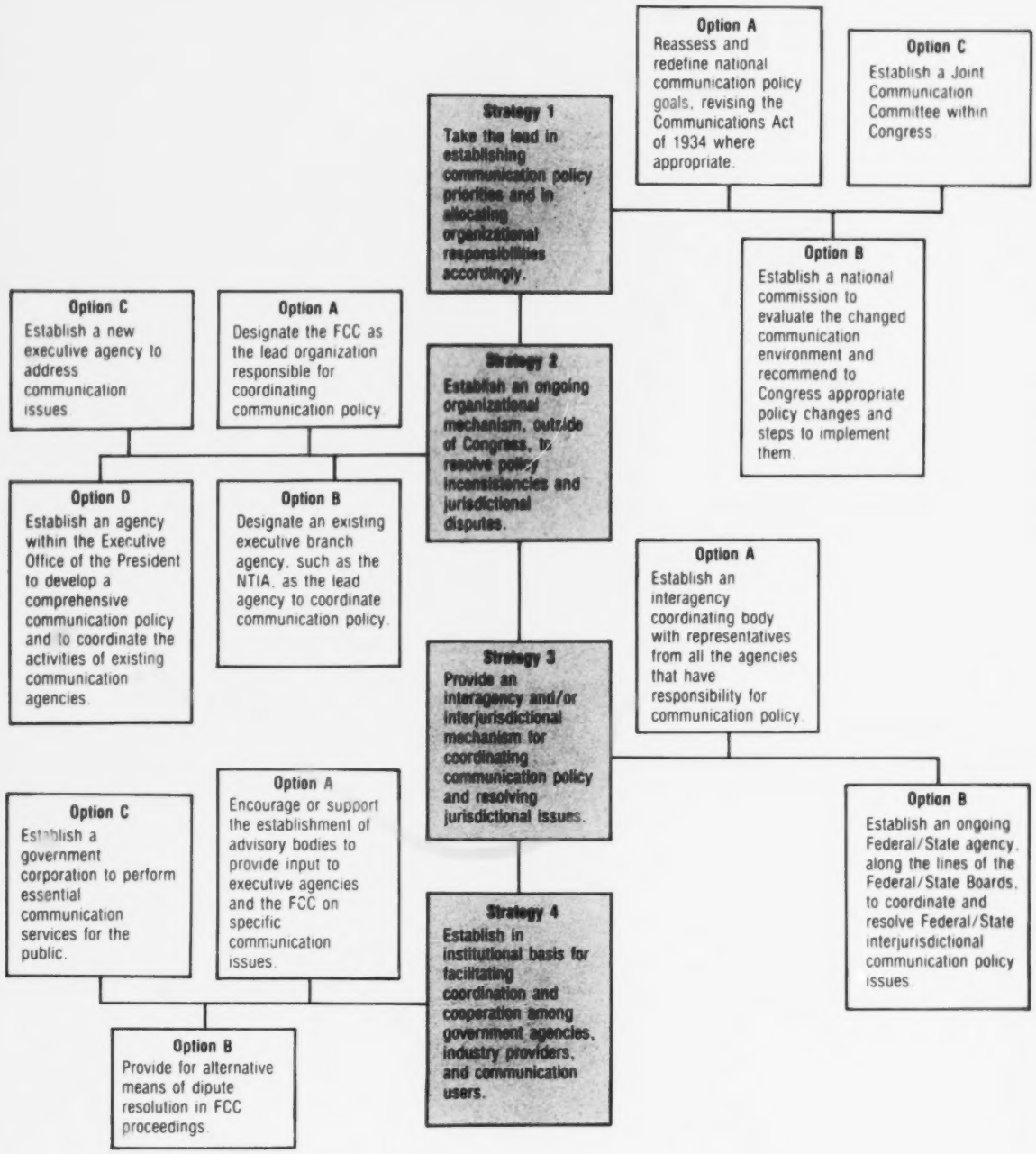
The choice of congressional policy strategies and options will depend primarily on how Congress views the role of communication in 21st-century America and what communication goals it will set for the Nation. This study provides Congress with a roadmap for matching

Figure 4—Congressional Strategies and Options To Address Modernization of the Communication Infrastructure


Strategy 1
Direct government involvement in the development, planning, financing, and coordination of the communication infrastructure
Option A
Create a new legislative mandate for promoting the Nation's communication infrastructure that both updates the Nation's communication policy goals and clearly designates responsibility for implementing them
Option C
Establish government-affiliated institutional arrangements to foster the research, development, and deployment of communication and information technologies
Option E
Facilitate the evolution and deployment of new communication technologies by promoting the establishment of interindustry and industry/user forums
Strategy 2
Provide indirect incentives for modernizing and developing the communication infrastructure.
Option C
Alter depreciation rates to encourage modernization
Option B
Establish user taxes and channel revenue for modernization purposes
Option A
Provide tax credits for R&D or capital expenditures for modernization
Option B
Increase government funding for R&D in the area of communication and information technologies
Option D
Establish an agency within government with the responsibility for directing and coordinating the development of communication and information technology
Option F
Promote and facilitate the dissemination of R&D information
Strategy 3
Create a regulatory environment that is more conducive to the modernization of the communication infrastructure.
Option A
Alter allowable rates of return
Option B
Allow regulated companies to price their products strategically in order to discourage bypass of the public network
Option C
Extend the lines of business that regulated telephone companies can enter

SOURCE: Office of Technology Assessment, 1990.

Figure 5—Congressional Strategies and Options To Address Jurisdictional Issues in Communication Policymaking


Strategy 1
Take the lead in establishing communication policy priorities and in allocating organizational responsibilities accordingly.
Option A
Reassess and redefine national communication policy goals, revising the Communications Act of 1934 where appropriate.
Option B
Establish a national commission to evaluate the changed communication environment and recommend to Congress appropriate policy changes and steps to implement them.
Option C
Establish a Joint Communication Committee within Congress.
Strategy 2
Establish an ongoing organizational mechanism, outside of Congress, to resolve policy inconsistencies and jurisdictional disputes.
Option A
Designate the FCC as the lead organization responsible for coordinating communication policy.
Option B
Designate an existing executive branch agency, such as the NTIA, as the lead agency to coordinate communication policy.
Option C
Establish a new executive agency to address communication issues.
Option D
Establish an agency within the Executive Office of the President to develop a comprehensive communication policy and to coordinate the activities of existing communication agencies.
Strategy 3
Provide an interagency and/or interjurisdictional mechanism for coordinating communication policy and resolving jurisdictional issues.
Option A
Establish an interagency coordinating body with representatives from all the agencies that have responsibility for communication policy.
Option B
Establish an ongoing Federal/State agency, along the lines of the Federal/State Boards, to coordinate and resolve Federal/State interjurisdictional communication policy issues.
Strategy 4
Establish in institutional basis for facilitating coordination and cooperation among government agencies, industry providers, and communication users.
Option A
Encourage or support the establishment of advisory bodies to provide input to executive agencies and the FCC on specific communication issues.
Option B
Provide for alternative means of dipute resolution in FCC proceedings.
Option C
Establish a government corporation to perform essential communication services for the public.

SOURCE: Office of Technology Assessment, 1990.

There is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new order of things.

Machiavelli, 1513.

U.S. communication policy with consistent strategies and policy options, based on the five issues discussed above. Three possible visions are presented here:

1. communication as a market commodity,
2. communication as a springboard for economic growth and development, and
3. communication as a basic societal infrastructure.

These visions are purposely sharply drawn to provide clear alternatives.

Market Vision—Communication as a Market Commodity

This vision reflects the view that communication is an end in itself, and that communication services should be treated like any other commodity that can be bought and sold. This view is illustrated at the extreme by former FCC Chairman Fowler's statement equating television sets and toasters, which, he said, leads to the conclusion that the marketplace is the most appropriate mechanism for determining the production, distribution, and use of television sets as well as other communication devices and services.

Those with this perspective include many antitrust economists and lawyers who place a high value on economic efficiency, viewing its attainment as the measure of an optimal social outcome. They claim that through market competition the criterion of efficiency is most likely to be met. Supporting this viewpoint are many new participants in the communication system (for example, resellers of communication services, system integrators, and gateway and information vendors) who, eager to take advantage of the new technologies to add value to existing products and services, want a chance to enter the market and compete. Many business users who operate their own private communication networks also subscribe to this point of view. So, too, would consumer advocates who, viewing communication primarily as a commodity, are concerned most about the cost of service to consumers.

Viewing communication policy from this perspective, the ideal role for the Federal Government would be to intervene to correct or ameliorate situations where market failures can be clearly identified. Members of this group might disagree, however, about the means of government intervention. While some favor trying new or experimental regulatory approaches such as price-cap regulation for telephone companies, others insist that, where real competition is lacking, adequate protection for users and potential competitors requires traditional rate-of-return regulation. With these differences in mind, the following congressional strategies are consistent with the vision of communication as a commodity, and the government's perceived role:

- reexamining and readdressing regulatory categories in terms of the market structure of various industries as it is affected by technological advances, and strengthening regulatory procedures where required;
- refining computer crime laws and penalties;
- allowing for the emergence of market solutions to problems of incompatibility;
- influencing the standards-setting process indirectly by providing assistance and guidance to foster standards-setting;
- providing indirect incentives for modernizing and developing the communication infrastructure;
- providing for some technology research and development; and
- phasing out some existing regulatory agencies and integrating others.

Economic Vision—Communication as a Springboard for National Economic Growth and Development

This vision reflects concerns about the state of the U.S. economy and the decline of the U.S. competitive position in an increasingly global economy, and calls for the promotion of communication technologies and the modernization of the communication infrastructure. Proponents view communication not just as an end in itself, but also—and more importantly—as *the* means for bringing about renewed economic growth and development in the United States. Some are concerned lest other nations—viewing the modernization of their communication infrastructures as part of their overall national industrial policies—employ new communication technologies to gain a competitive advantage over the United States.

Most who hold this view would agree that the communication infrastructure can serve a number of social goals. However, because of the growing intensity of international economic competition, some would argue that, where societal goals conflict, using communication to foster national economic goals should take precedence. They would point out that, if the United States fails to achieve economic success, it will no longer have the wherewithal to accomplish other goals.

Such arguments have been made by a number of government officials who deal with trade and national industrial policy issues. This viewpoint is also reflected in some recent government reports calling for a revision of the Modified Final Judgment[4] and alternatives to rate-of-return regulation. Most of the regional Bell operating companies that stand to benefit from these changes also use this argument when presenting their case to government. Some users in small and medium-sized businesses who cannot afford to develop their own communication networks, but who view communication as a strategic resource, might also be inclined to favor the view of communication as the "springboard for economic growth."

Proponents of this view call on the Federal Government to play a more active role in promoting technological development and the modernization of the communication infrastructure. While they might differ on how to promote communication technologies for economic ends, the congressional strategies consistent with this overall viewpoint include:

- providing direct government support for users to access information and communication paths;
- undertaking further study and analysis of the changing security and survivability needs of the communication infrastructure;
- providing special emergency facilities for private sector use;
- improving coordination of survivability planning;
- increasing activities geared to prevent security breaches;
- supporting research to provide better data and a greater analytic rationale for standards decisions;
- while allowing for market solutions to standards problems, providing for a government role when necessary to achieve overall, national economic goals;
- providing indirect incentives to encourage investment in modernization;
- removing regulatory barriers that discourage modernization; and
- taking the lead in establishing communication policy priorities, and in allocating organizational responsibilities accordingly.

[4]The Modified Final Judgment was the 1982 consent agreement entered into by AT&T and the Department of Justice, and subsequently approved by the U.S. District Court for the District of Columbia. AT&T retained most long-distance operations and terminal equipment. The Bell operating companies were spun off and reorganized into seven regional holding companies. They were permitted to offer local monopoly services, as well as toll services within their restricted operating territories. They could provide new terminal equipment, but could not engage in manufacturing.

Social Vision—Communication as Social Infrastructure

This view emphasizes the linkages between communication, human activity, and social structures. It focuses on the relationship between access to communication and services, and access to power, wealth, and position in society. Hence, in weighing communication policy choices, it places great weight on equity. Because proponents of this vision hold that communication can serve as a means as well as an end, they often propose communication-related solutions to many of society's problems.

This viewpoint is currently not well represented in the communication policy community. There are, however, many in the academic community—especially in departments of communication and social science—who strongly advocate this point of view. There are also many educators, health providers, government officials, and citizen activists who see in communication a potential for assisting them in solving their problems. Communication providers who could benefit from significant economies of scale and scope by expanding and integrating their services would also support this view.

Those who view communication as a means to accomplish societal ends historically have tended to grow in number (or at least to become more vocal) as technological advances in communication give rise to new aspirations. This was so for the penny press, telegraph, telephone, radio, and television; and it is likely to be so as the Nation moves forward in an age of information and advanced communication.

For those who view communication as social infrastructure, the role for government is to ensure not only that needed technologies and communication services exist, but also that they are available to everyone and will serve all social purposes on an equitable basis. Thus, they strongly advocate—in addition to many of the strategies identified for the Economic Vision above—congressional strategies that are more directly designed to improve access. These would include, for example:

- influencing the means by which communication services are funded and financed;
- structuring the prices at which communication and information services are offered;
- regulating and redefining the rights of media-owners;
- influencing the level and availability of the tools and resources required to access communication and information services; and
- assuming a more proactive role to assure robust debate on issues of public importance.

Whereas those who adhere to the Economic Vision might want to limit government's role if it appeared to create additional burdens for business and industry, those who view the infrastructure more generically might not be so inclined. Considering all social goals to be more or less equivalent, adherents of this Social Vision might also favor the following strategies:

- establishing security and survivability standards for communication systems in key industrial sectors;
- influencing the setting of particular standards by providing direct incentives or by imposing sanctions where necessary to achieve social ends; and
- mandating industrywide standards where necessary to achieve social ends.

CONCLUSION

Before selecting communication policy strategies for the future, Congress will first need to consider how it views the role of communication in society. This report provides a context for these considerations by analyzing and reviewing the changes taking place in the communication infrastructure. It identifies the range of societal opportunities that new communication technologies afford, and the problems and issues to which these new technologies give rise. If Congress can agree on a consistent vision of communication goals, many policy choices will naturally follow. What is first required is a vision, and a commitment to pursue it.

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379